بسم الله الرحمن الرحيم

{ وجعلنا من الماء كل شىء حى}

{أفرءيتم الماء الذى تشربون ءأنتم أنزلتموه من المزن أم نحن المنزلون}

صدق الله العظيم

Media Office Of General Department Of *New Esna Barrage*

By Vision Of

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Presents

ARAB REPUBLIC OF EGYPT

MINISTRY OF WATER RESOURCES & IRRIGATION

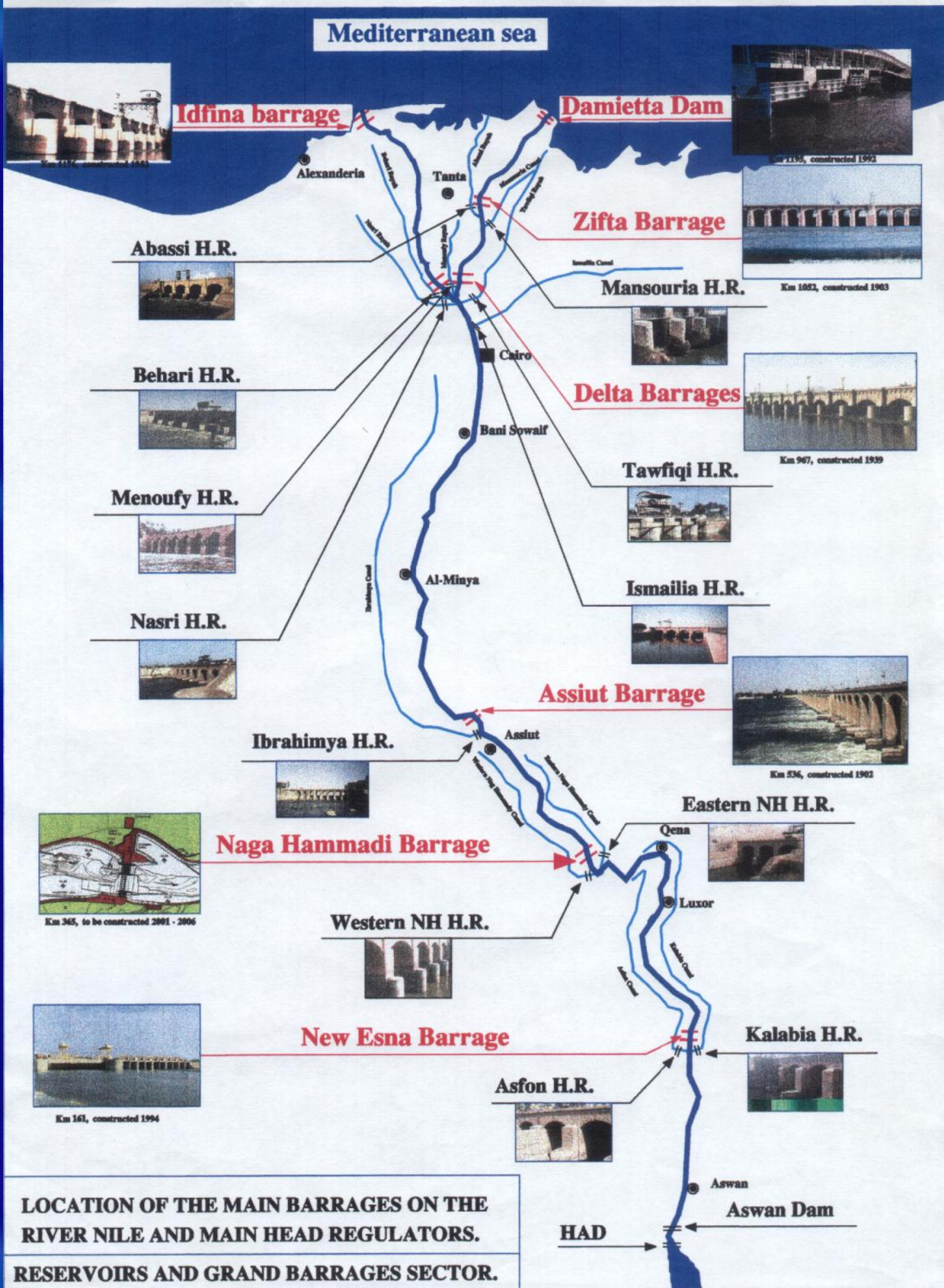
RESERVOIRS & GRAND BARRAGE SECTOR

GENERAL DEPARTMENT OF NEW ESNA BARRAGE

NEW ESNA BARRAGE AND POWER PLANT

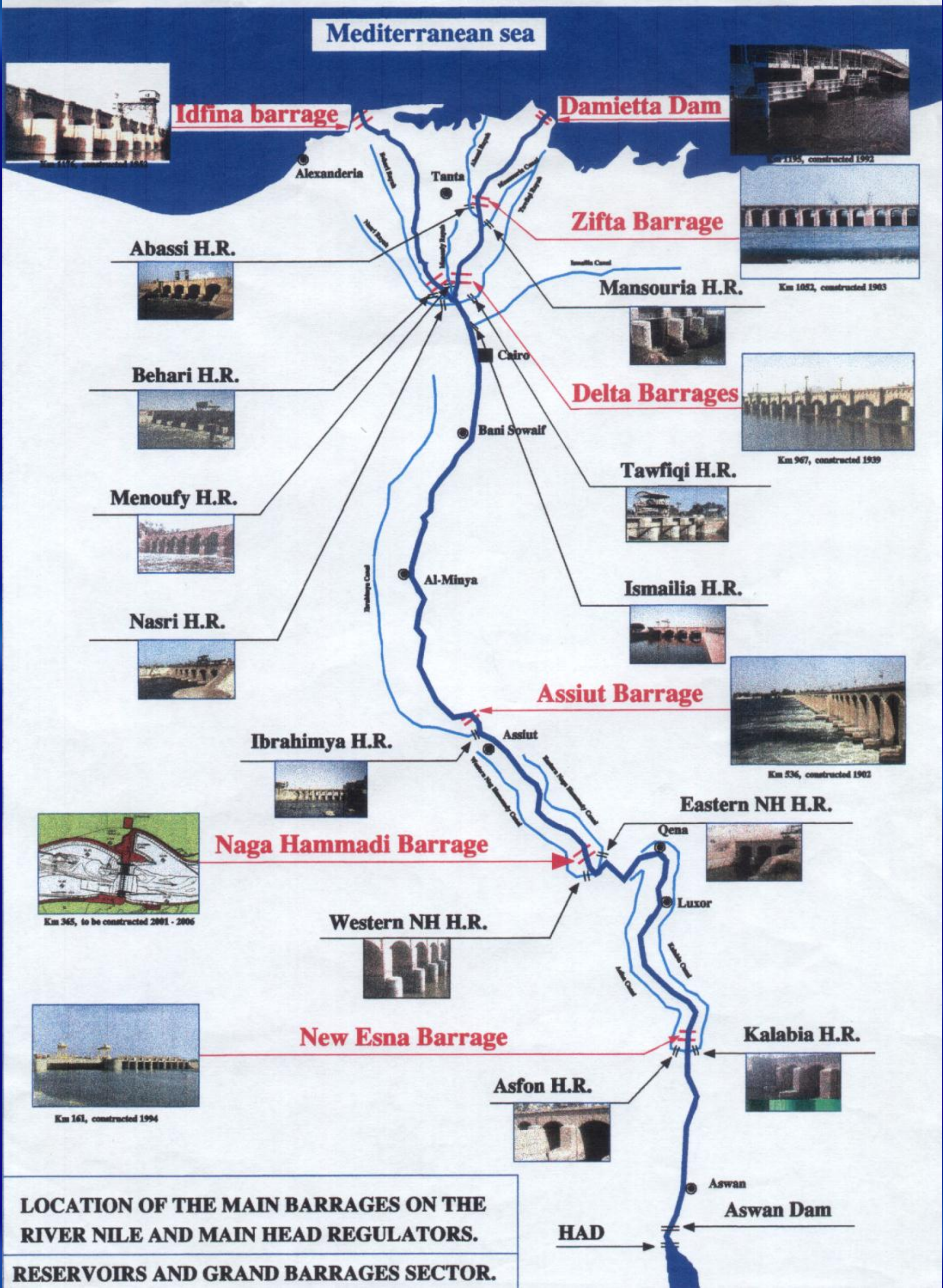
INTRODUCTION

- ***Since water is a heavenly gift sent by God it is our duty to preserve this bounty, especially as in safeguarding water and distributing it correctly.***
- ***On the basis of this principle, the Ministry of water Resources & Irrigation has taken responsibility for safeguarding water and distributing it.***
- ***To fulfil this responsibility, the Ministry has undertaken to monitor the progress of water from the time it falls as rain in the sources of the Nile both inside and outside Egypt***



INTRODUCTION

- *The Ministry has implemented various structures and facilities along the Nile, including dams and storage reservoirs, such as the Aswan High Dam and reservoir, to release water in accordance with man´s requirements and the needs of agriculture and industry.*
- *It has built various dams on the Nile in order to regulate water distribution and control flows so as to maximise profitability and minmise losses.*
- *These dams are the following Esna, Naga*



LOCATION OF THE MAIN BARRAGES ON THE RIVER NILE AND MAIN HEAD REGULATORS.

RESERVOIRS AND GRAND BARRAGES SECTOR.

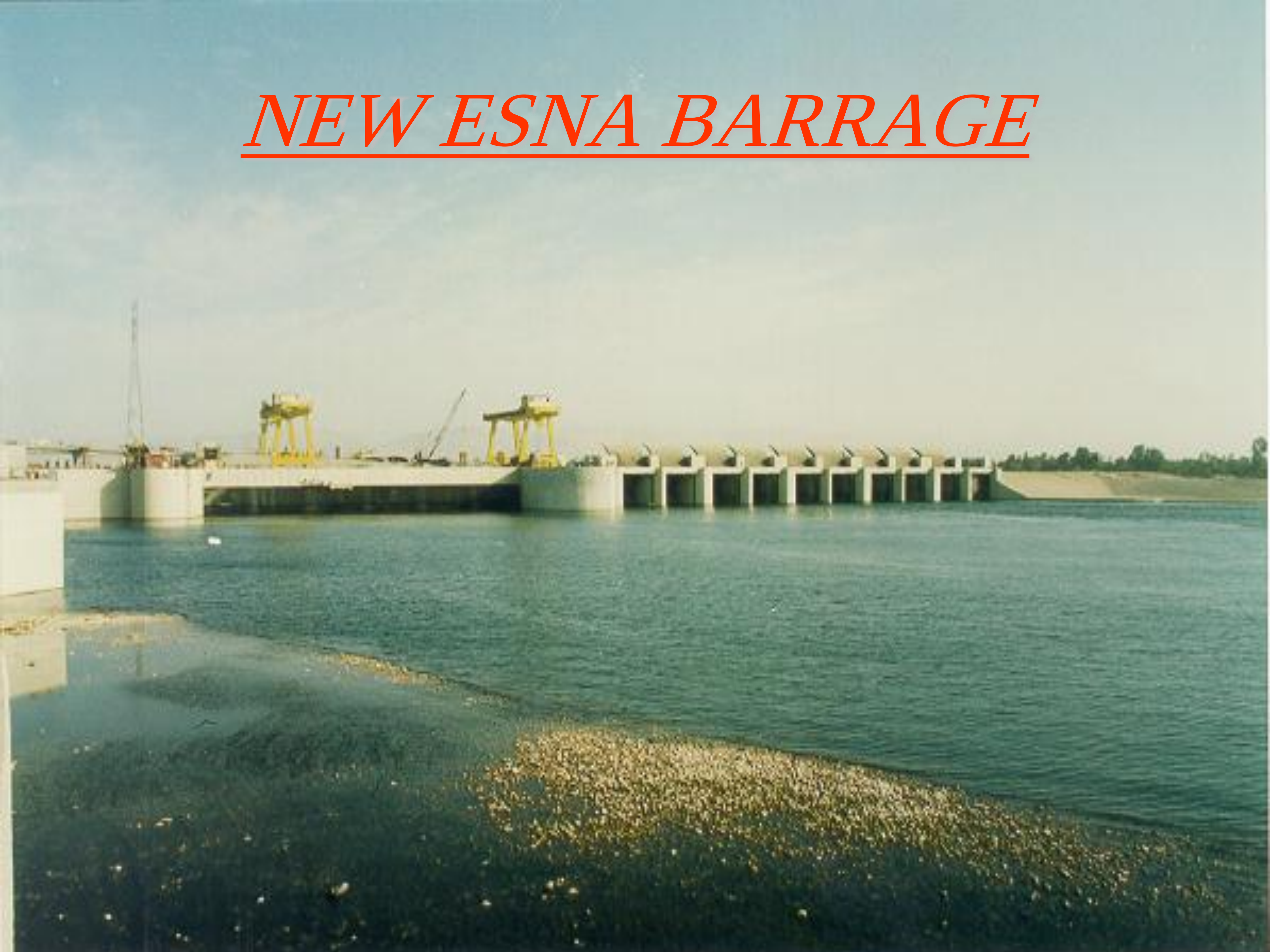
OLD ESNA BARRAGE

- The barrage consists of 120 opening, 5 meters in breadth each.
- The total length of the barrage is 900 meters.
- The piers width is 2 meters each, where every 20 opening there is a larger pier of 4 meters in width.
- The lock is 80 m in length and 16 m in width.
- The road is 12 m in width including foot pathes.

OLD ESNA BARRAGE

- ***The excavation works amount to 500.000 m^3.***
- ***Concrete volume is 40,000 m^3.***
- ***Stones and bricks are 300,000 m^3.***

NEW ESNA BARRAGE



THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

PREFACE

The new Esna Barrage and power project is located 1200 m downstream of the old structure and the main reasons that led to the construction of the new barrage are the following :

- The continuous increase in head difference due to degradation in the river channel.
- Problems pertaining to the stability of the old structure.
- The need to raise upstream levels to supply the different canals with required irrigation water.
- To develop the navigation lock to match the draught of the different types of vessels.
- To make use of the head difference between upstream and downstream to generate electric power.

THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

PROJECT GOALS

Construction of new barrage to replace the old one, makes possible to safely withstand the expected heads required for irrigation purposes. Save water which are released through the old barrage to keep the difference between U/S and D/S levels within permissible limits. Generate electric power of 634 Gwh/year from the head difference on the barrage. Development of navigation, by replacing the old lock by a new one, sufficiently large to accommodate two of the biggest ships operating on the Nile at the same time. A new road on the barrage crest with a capacity of 70 tonnes to link the two banks of the river. Creation of about 3000 job opportunities for the period of execution and 300 permanent jobs for maintenance and operation.

THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

PROJECT COSTS

Total cost is 650 million L.E .The cost break down is as follows: 350 million L.E. for civil works. 300 million L.E .for electromechanical works.

These costs were paid as follows:

94.350.000	U.S.D	Italian loan.
24.644.000.000	I.L.	Italian grant.
9.001.610	U.S.D	Romanian loan.
127.402.367	A.S.H.	Austrian loan.
11.607.000	F.F.	French loan.
3.000.000	F.F.	French grant.

The rest of costs were covered with Local Currency.

THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

THE CONTRACTOR

The contractor was a consortium named EUROCEB comprising of Italian and Romanian companies.

1) *IMPREGILO – (Italy).*
2) *COGEFAR – (Italy).*
3) *G.I.E. (Italy).*
4) *ROMENERGO (Romania).*

- *In addition to a group of local and Europian companies as sub contractors.*

1) *Arabian international construction development company.*
2) *Canal harbour and great project company.*
3) *Misr Engineering development company.*
4) *El Nile Public company for road construction.*
5) *Hidelco.*

THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

Consultantcy

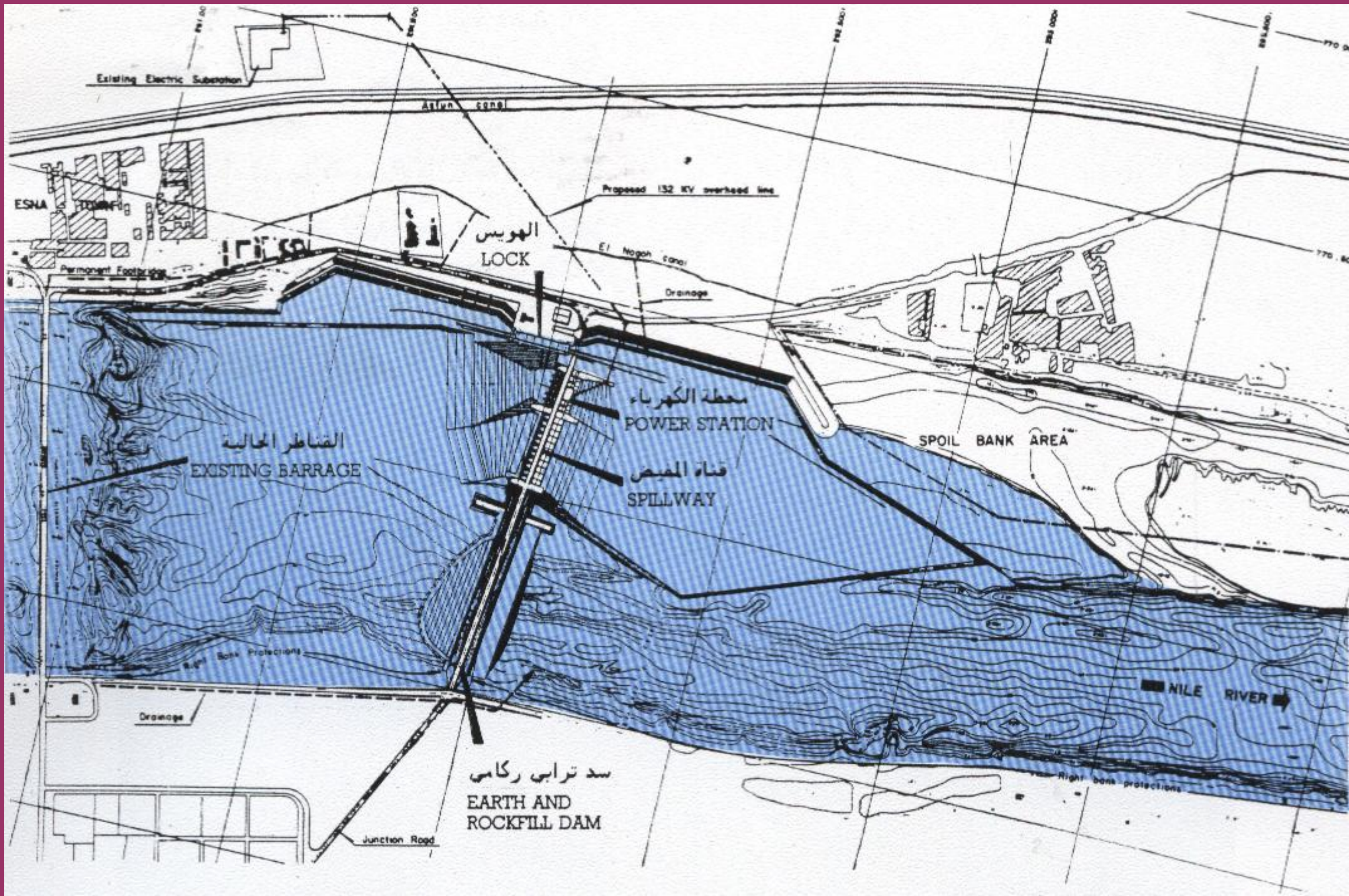
- *The Engineer was a consortium comprising of Local and French Consultants.*
  1) Engineering Design and Irrigation Projects Consulting office (Egypt).
  2) Electric Power Systems Engineering Company (Egypt).
  3) SOGREAH Consulting Engineers (France).
  All works were performed under over all supervision of the executive establishment for New Esna Barrage project which included engineers from Ministry Of Water Resources & Irrigation for civil works and engineers of Ministry Of Electricity for electromechnical works in power house.

THE NEW ESNA BARRAGE AND POWER PLANT PROJECT

General Description Of The Project

The New Esna Barrage and power project includes the following four main structures:

- *Navigation Lock.*
- *Power Plant.*
- *Spill way.*
- *Closure Dam.*



•General view of new Esna project

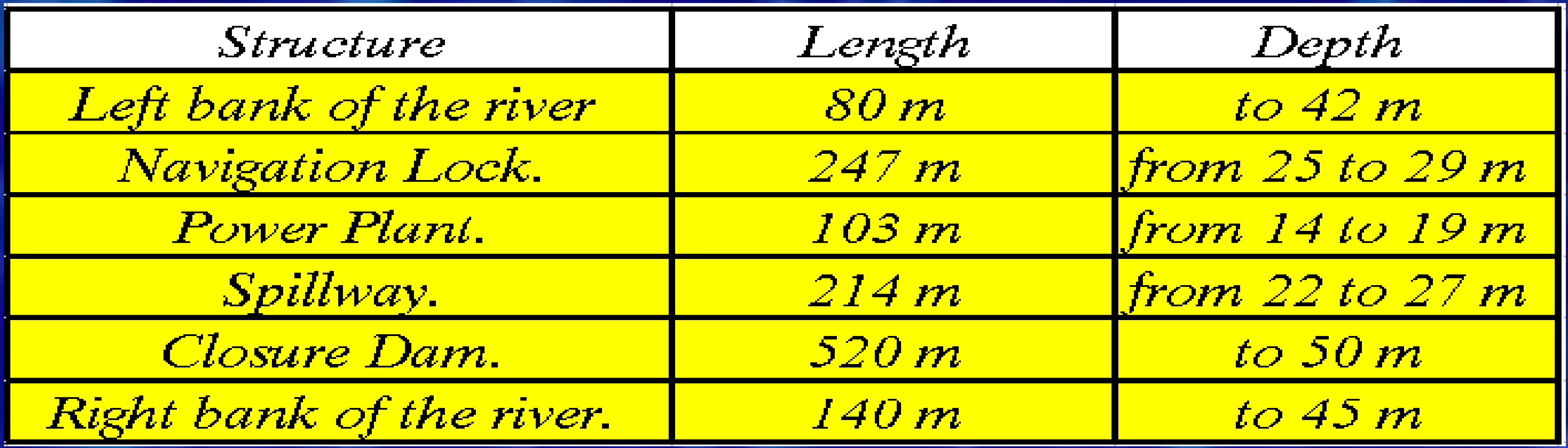
DIAPHRAGM WALLS

A) Temporary Diaphragm Walls

The temporary coffer-dam had also been supplied with a temporary diaphragm wall to prevent seepage of water and it was made up from mixture of cement and pentonite and water with a surface area of 62.000 m^2, with 60 cm thick. And depths reached to 45 m from top surface of temporary coffer-dam.

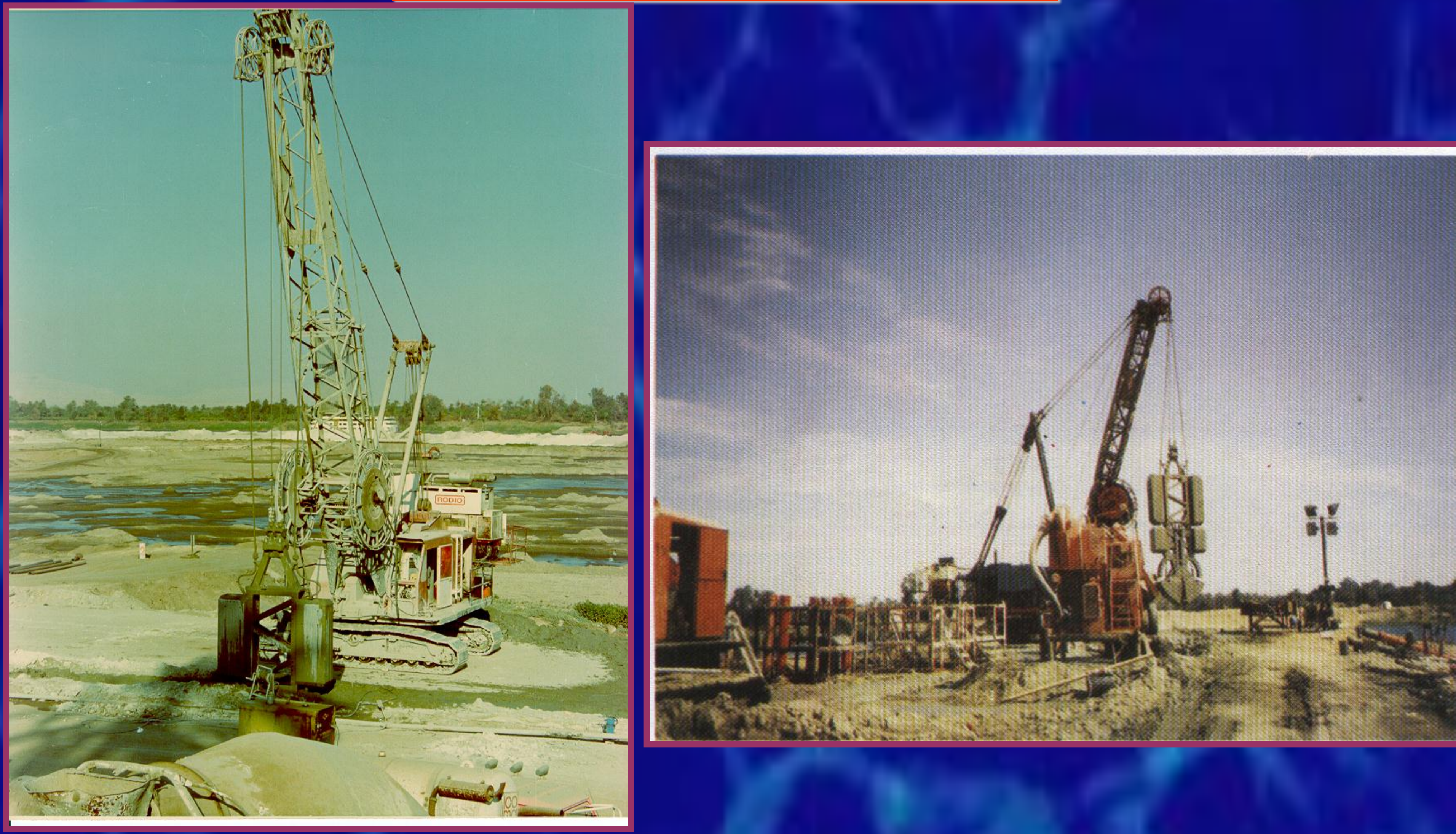
B) Permanent Diaphragm Walls

A permanent plastic concrete diaphragm wall had been extending under the concrete structures with 80 cm thick. And total surface area around 45.000 m^2 and it is composed of a mixture of cement , pentonite and water in addition to the sand and gravel , with the following depths.



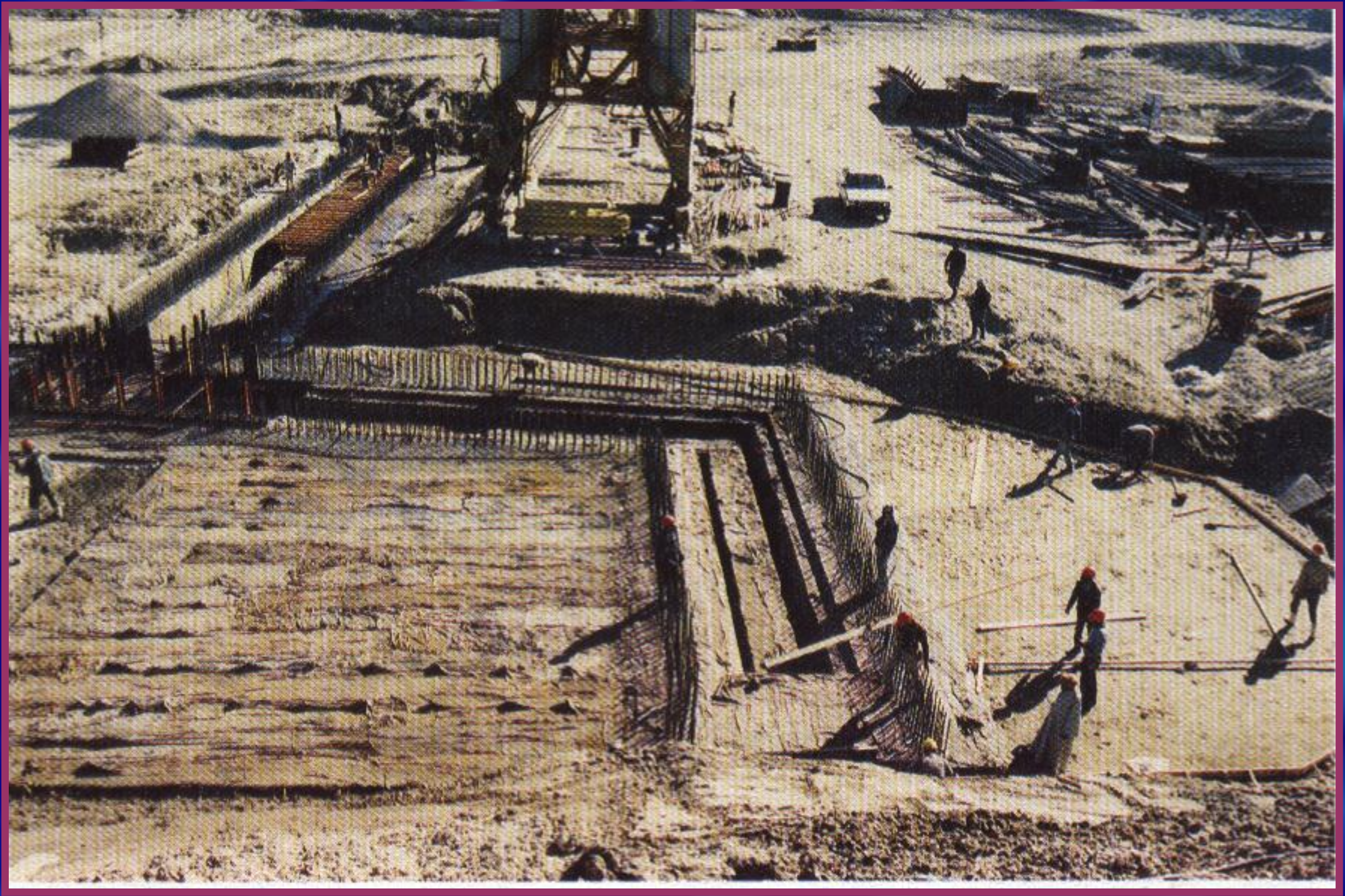
Structure	Length	Depth
Left bank of the river	80 m	to 42 m
Navigation Lock.	247 m	from 25 to 29 m
Power Plant.	103 m	from 14 to 19 m
Spillway.	214 m	from 22 to 27 m
Closure Dam.	520 m	to 50 m
Right bank of the river.	140 m	to 45 m

DIAPHRAGM WALLS



- ***Diaphragm wall excavator***

DIAPHRAGM WALLS



- *Permanent diaphragm walls*

THE TEMPORARY COFFER-DAM

•The aim of temporary coffer dam is to protect the execution of the works during the construction period against flooding and it had been designed to withstand flow of 2900 m³/ Sec., which equal to 250 million m³/Day.

• Cofferdam top level 75.50 m

•Top width 15 m.

•Length 1880 m.

and it was consisted of 95 thousand m³ of sand and pit run gravel.

A group of wells had been constructed inside the temporary coffer dam and were supplied with pumps for the dewatering system, in addition to the temporary diaphragm wall, so as to be able to control the water level during the excavation period.

•Temporary coffer dam & earth works

• Dredging out side coffer dam

EARTH WORKS

- ***The excavation and dredging inside and outside the cofferdam measured 6 million cubic meter.***

•Earth works

PROTECTION WORKS

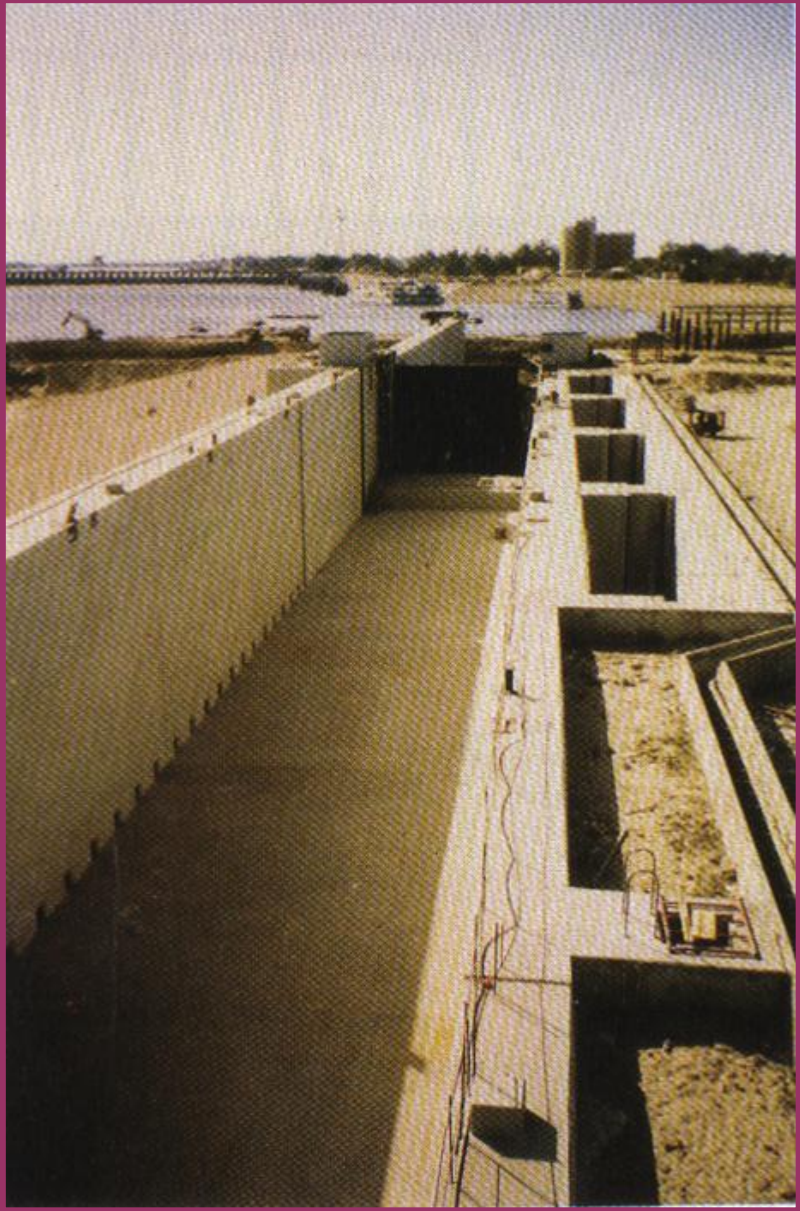
1- Protection works with rip-rap (natural aggregates) which their diameters were ranging from 3 cm to 100 cm reached 170.000 m^3

2- Protection works, using transition soil (Filter) reached 80.000 m^3. 3- Protection works with Geotextile

- U/S Protection works for left side bank

NAVIGATION LOCK

- Located on the left bank of the Nile river, it is main characteristics are the following :-
  - Length : 160 m.
  - Width : 17 m.
  - Min. Draught : 3 m.
- The reinforced concrete that was used in the lock measured 85.000 m³ and 6100 tonnes of rein forced steel bars had been used with it.



•Navigation lock before operation

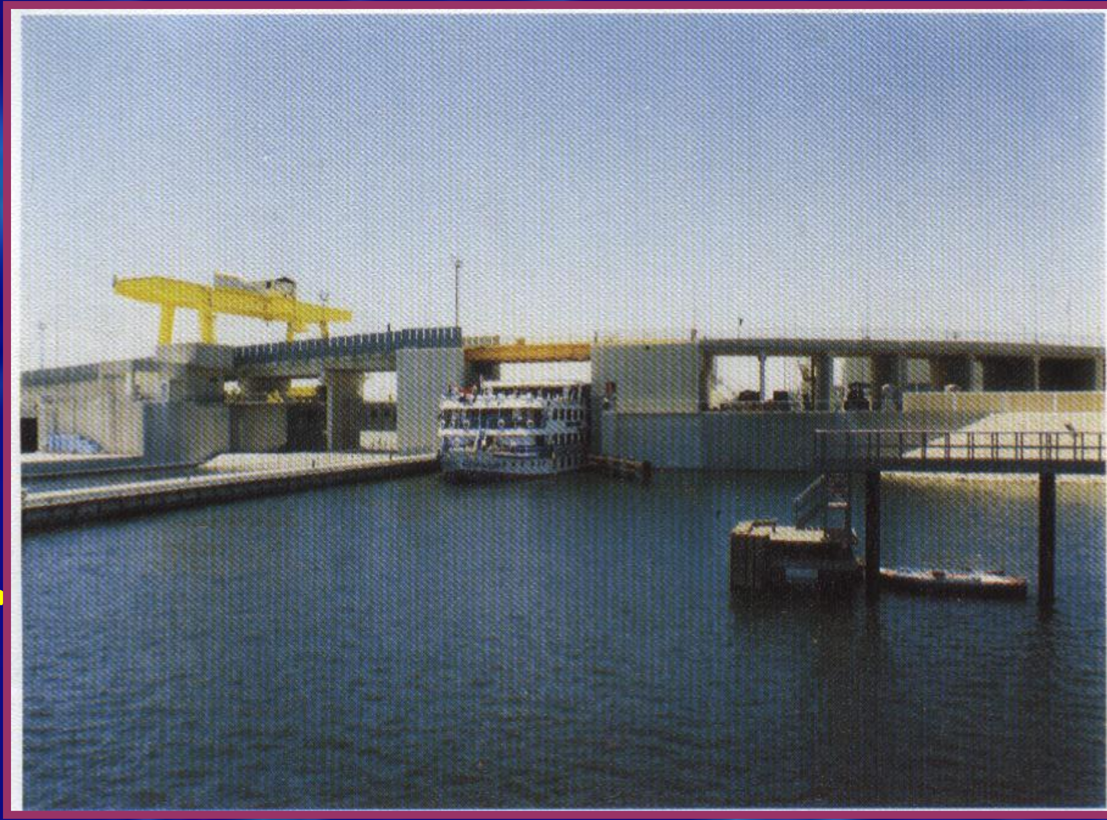
NAVIGATION LOCK

- *The lock is filled and emptied by lateral culverts including opening located at the lock floor level, allowing good distribution of the flow and water levels to transfer the river units between upstream and downstream the barrage.*
- *The Lock is equipped with upstream and downstream miter gate and two slide – type stop logs and a bascule bridge with 17 m span.*

•Navigation lock gates

NAVIGATION LOCK

- Through the control tower and the hydraulic controlling systems , the closing and the opening of the gates of lock and side channel gates had been controlled with an electronic networks.
- Boat entry and exit operations are facilitated by up stream and down stream guide walls.
- The total lock cycle takes about 25 minutes for passing two of the biggest vessels in one turn.



•D/S Navigation lock during operation

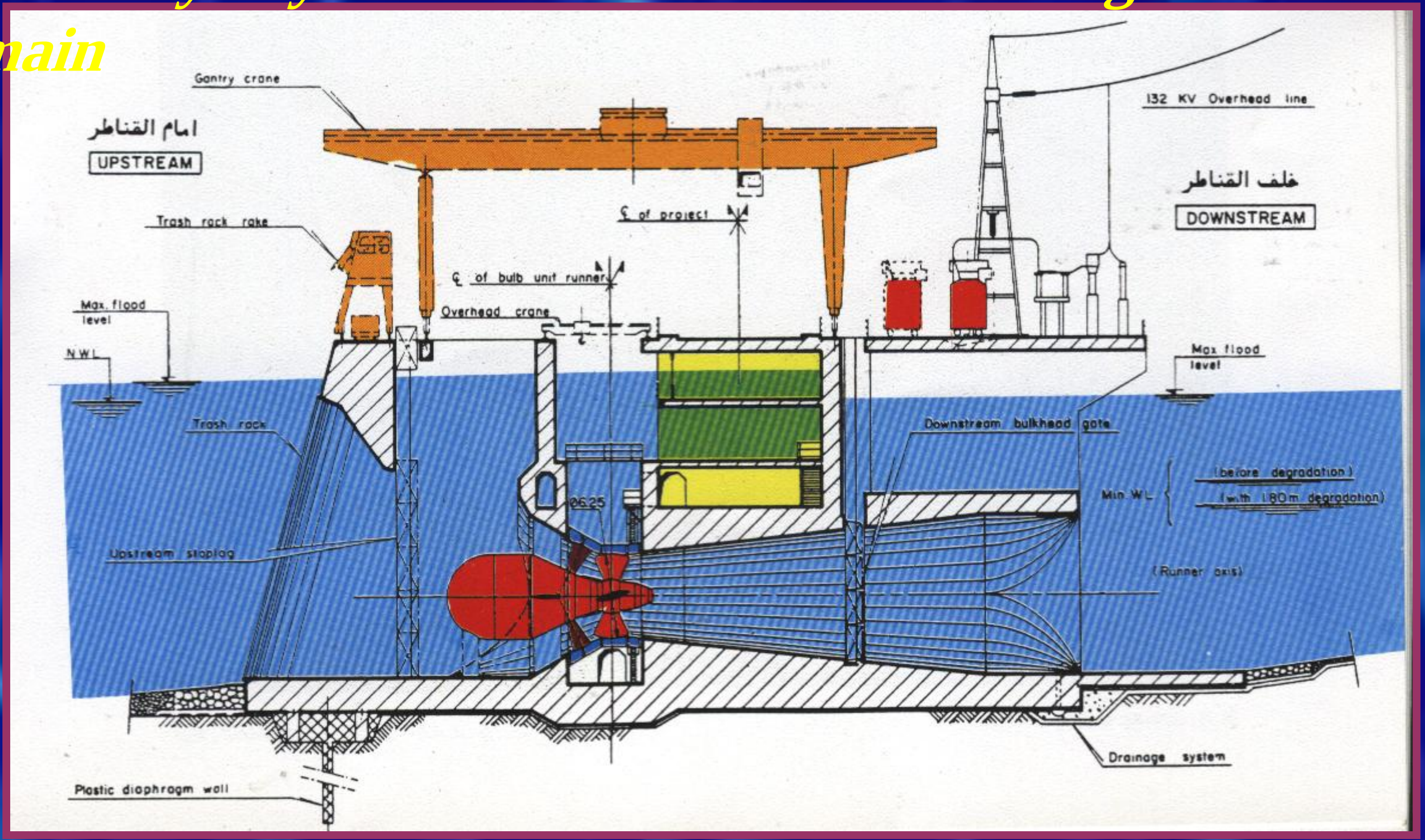
NAVIGATION LOCK

- The waiting areas upstream and downstream the lock have been equipped with mooring posts and gang ways.
- One top of the lock, the barrage have been supplied with a high bridge loaded 70 tonnes links the two banks of the river with level which permits the sailing of boats without opening the moving bridge and hindering the movement of cars over the bridge.

•Navigation lock before & after floodin

POWER PLANT

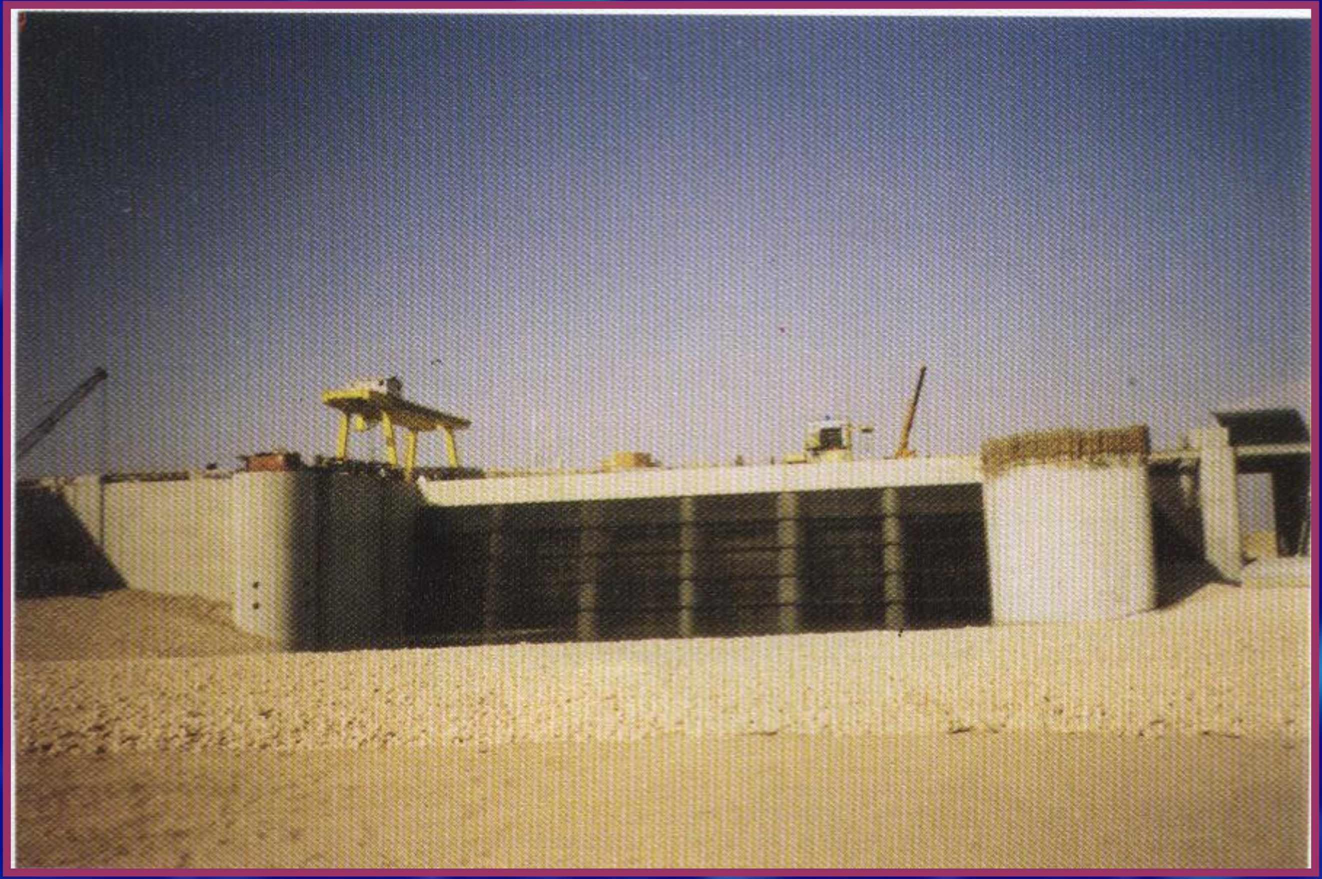
- *The power plant structure is connected to Navigation Lock on the left bank of the Nile River through assembly bay and it is main*
- *characteristics are as followed :*
  - *▪ Length 110 m.*
  - *▪ Width 60 m.*
  - *▪ Height 28 m.*



•Sectional view of the power station

POWER PLANT

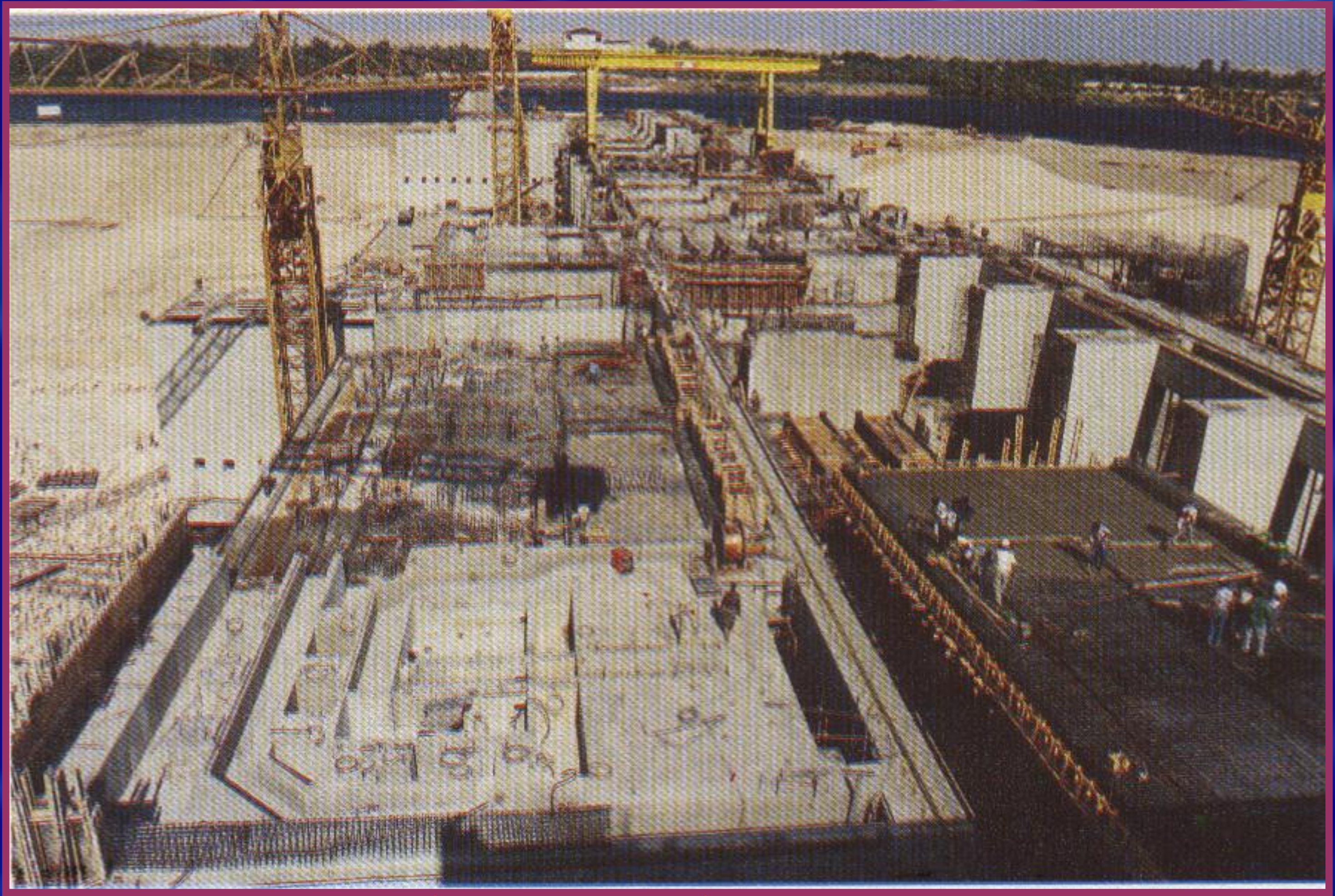
- *The power plant is equipped with six bulb turbines directly connected to generators. The energy produced by the generators is transferred to new Switch Yard by three circuits 132 K.V. from which is goes to the existing Esna Substation by two Circuits 132 K.V.*



- *U/S Power House before flooding*

POWER PLANT

- *The reinforced concrete that was used in the power plant measured 125.000 m³, with 11800 tonnes of reinforced steel bars.*

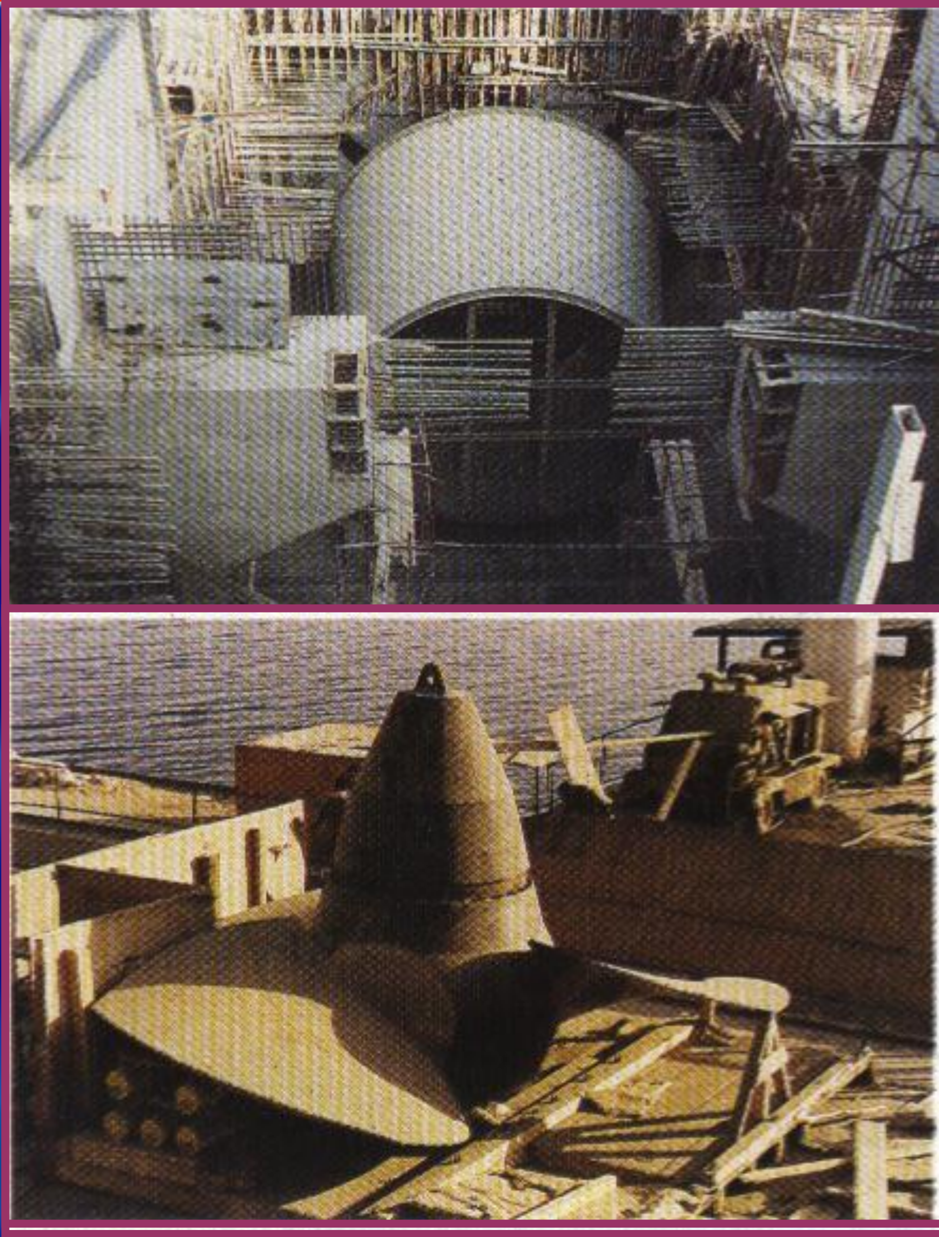


- *Power House during construction*

POWER PLANT

Equipments

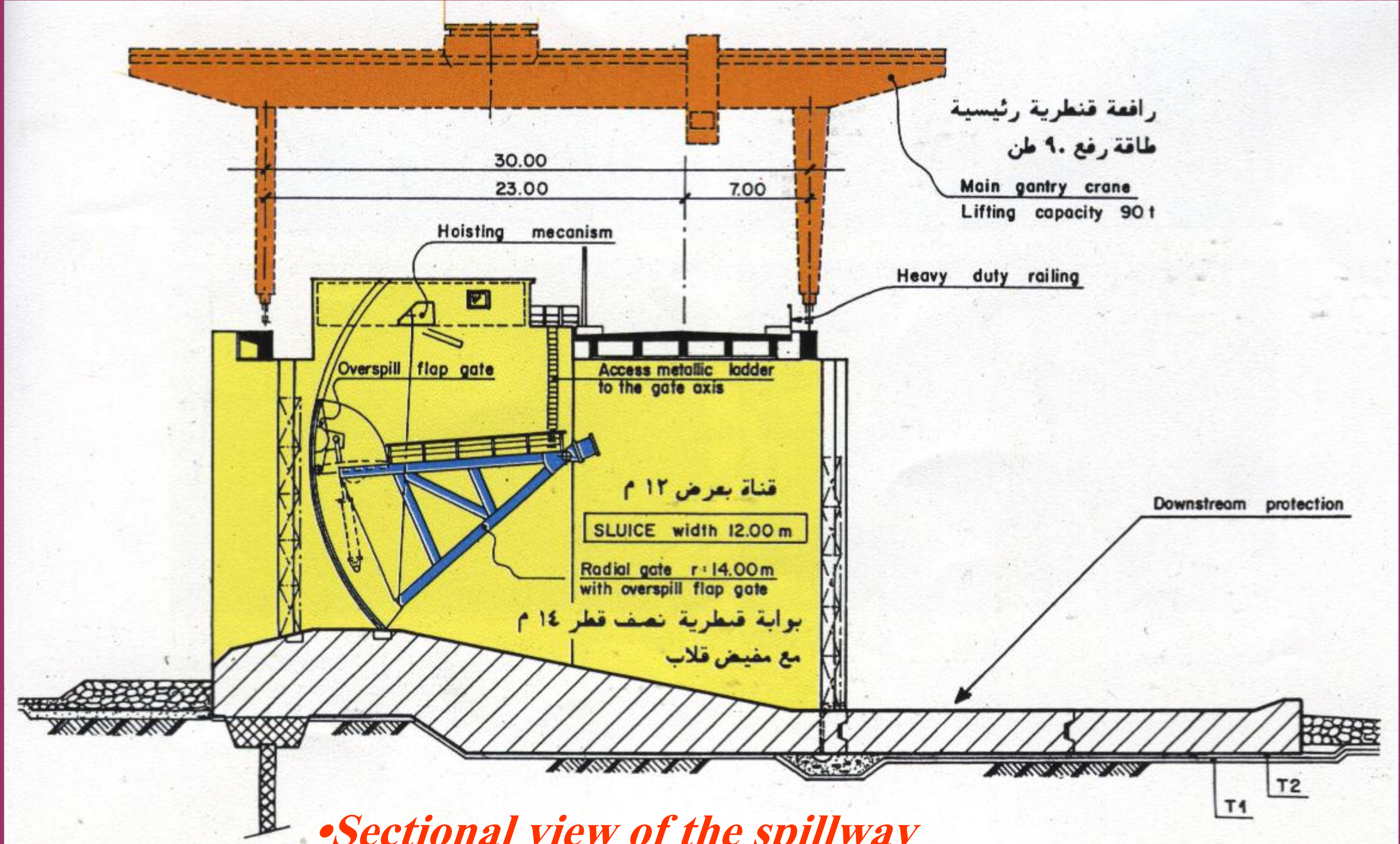
- 6 bulb units (P = 6 X 14.28 MW).
- 3 three phase transformers (132 / 11 / 11K.V – 34 / 17 / 17 M.V.A.), 50cps.
- 2 U/S stop-logs for maintenance.
- 1 trench - rack rake.
- 1 gantry crane 900/320 KN.
- 2 D/S stop logs for maintenance.
- 2 standby diesel generators (2x1000) K.V.A, 380V, 50Hz.



•Mechanical parts

SPILLWAY

The spillway is located immediately after the power plant separated by a dividing pier which channel the water upstream and downstream the structure. It is main purpose is to maintain the normal pool level at EL. 79.00 m and allow exceptional floods of 7000 m³/Sec. to be regulated.



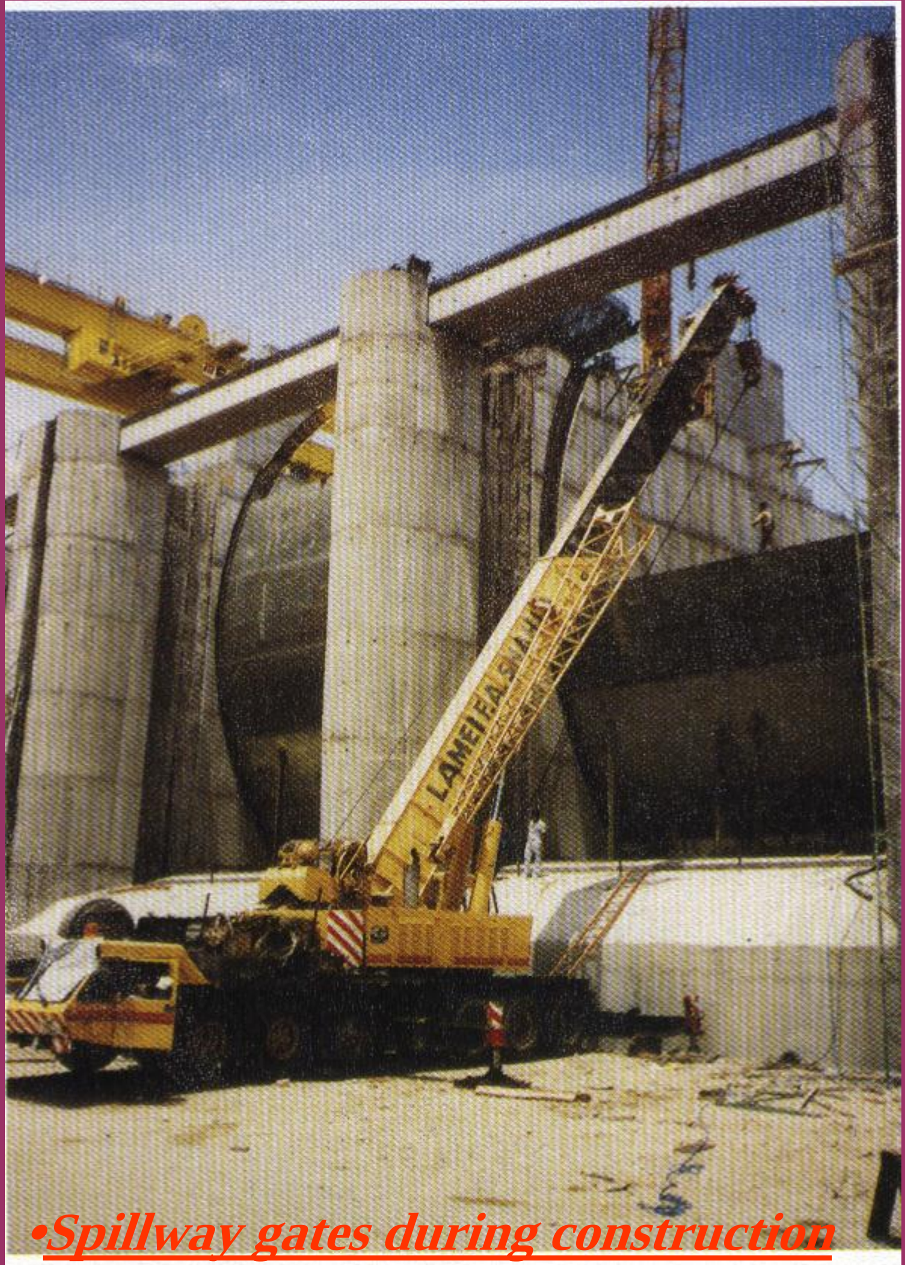
•Sectional view of the spillway

SPILLWAY

Equipments

- 11 radial gate (12m x 12.90m) including two with flaps.
- 2 U/S stop logs of slide type.
- 2 gantry crane 900/320 KN.

The structure comprises of eleven bays equipped with radial gates, the two outer ones being provided overspill flap gates to enable floating debris to be disposed of each bay is provided with upstream and downstream stop log grooves. .



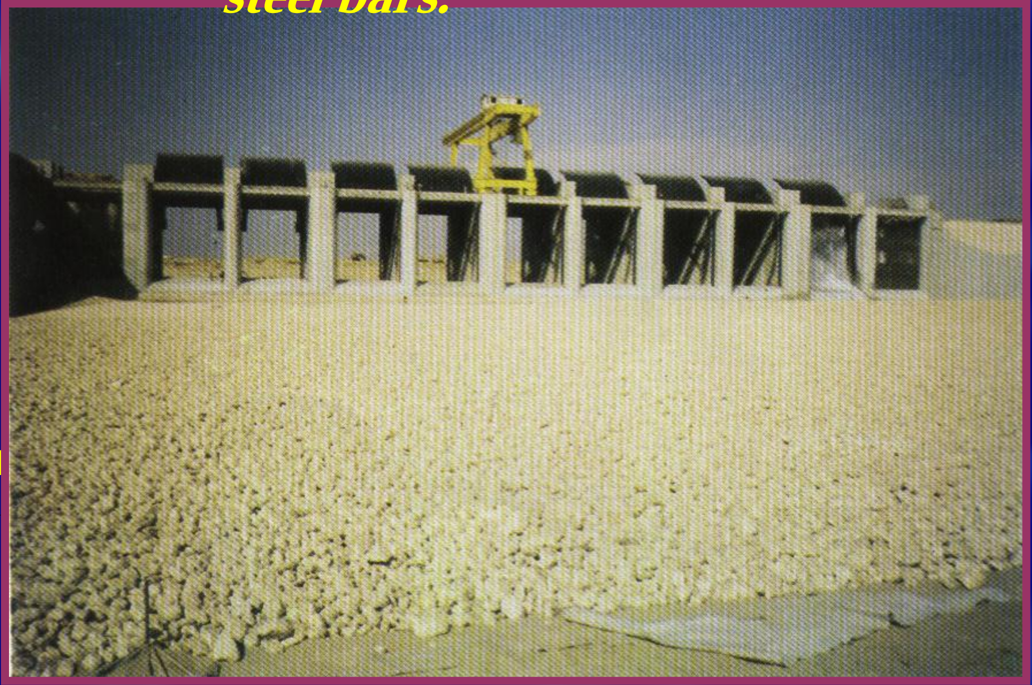
•Spillway gates during construction

SPILLWAY

Equipments

The stop log sections are handled by the gantry cranes, The 40 m wide stilling basin is located immediately downstream of the spillway. It dissipates of the energy generated by the water, passing through the gates. A reinforced plastic concrete diaphragm wall had been constructed behind the stilling basin with a depth of 12 m from the spill way foundation´s level in order to prevent the scouring of soil particles, with 80 cm thick, and 1660 m^3.

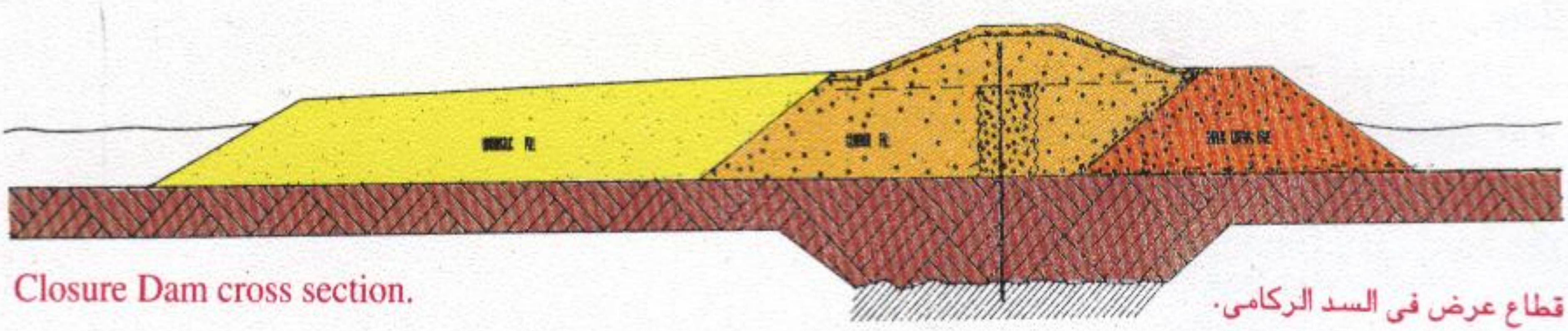
- The reinforced concrete which were used in the spillway measured 90.000 m^3, with 7500 tonnes of high tensile reinforced steel bars.



- U/S spillway before flooding

EARTH AND ROCK FILL DAM

- ***The earth and rock fill dam completes the river closure on the right bank of the Nile in the deepest section of the river used by navigation during the construction phase.***
- ***The closure itself consisted of a rock fill embankment built on a transition layer, followed by the body of the embankment consisting of sandy and pit run gravel material.***
- ***Finally, protective rip-rap was placed over the surface of the closure dam, while water tightness of the sandy and pit run gravel embankment was ensured by the construction of a plastic diaphragm wall extending into the hard clay foundation layers.***

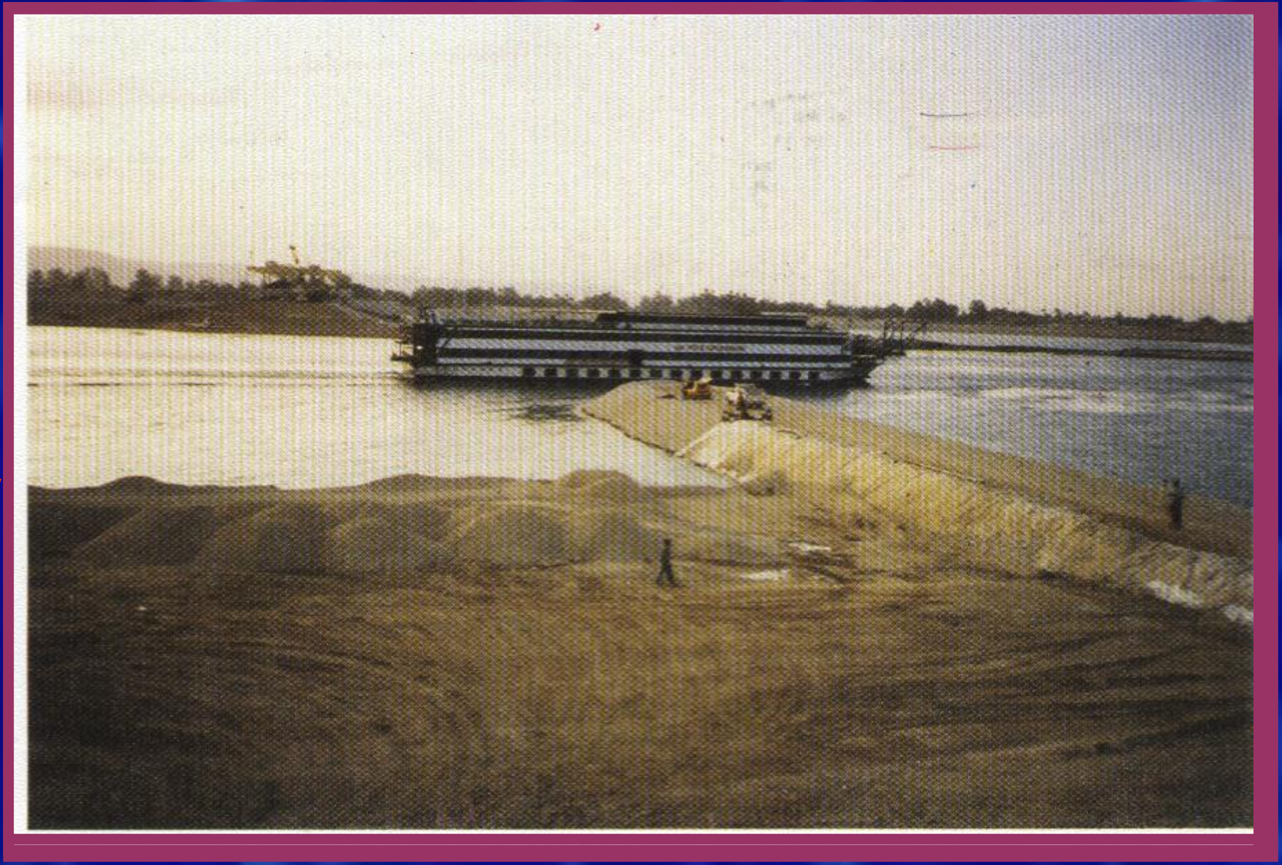


Closure Dam cross section.

قطاع عرض فى السد الركامى.

EARTH AND ROCK FILL DAM

- ***The length of the closure dam is 520 m.***
- ***The total quantity of fill and construction materials are 675.000 m³.***
- ***Width of closure dam at bottom 225 m and top width 15 m.***
- ***Max. height 22.50 m.***



•Closure dam during construction

GERMANY

EGYPT

By Help Of God, Peace and Cooperation We Can Make Our Future